

What is claimed is:

1. A tactile pin holding apparatus comprising:
  - a holding member having a tactile surface and a first number of holes, and being provided for supporting the first 5 number of tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column and in a second number of groups at the tactile surface, the second number 10 being smaller than the first number; and
    - elastic members, in the second number, respectively corresponding to the second number of groups of tactile pins and being arranged at the holding member for pressing and holding the tactile pins with the holding member in a manner 15 that each of the tactile pins in each of the groups of tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins and can thereby be held at a desired height relative to the tactile surface, and that the each of the tactile pins is 20 movable up-and-down when a force exceeding a given value is applied to the each of the tactile pins in up-and-down direction.
2. The tactile pin holding apparatus according to claim 1, wherein the second number is the number of rows of tactile 25 pins, and each of the elastic members provided for each of the

rows of tactile pins is an elastic ring placed annularly at the holding member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

3. The tactile pin holding apparatus according to claim 1,  
5 wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are  
10 pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

4. The tactile pin holding apparatus according to claim 1,  
wherein the second number is equal to half of the number of  
15 tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of  
20 the elastic segment.

5. The tactile pin holding apparatus according to claim 1,  
wherein the each of the tactile pins in the each of the groups  
of tactile pins has an annular groove for engagement with the  
elastic member corresponding to the each of the groups of  
25 tactile pins.

6. The tactile pin holding apparatus according to claim 1, wherein the holding member is disc-shaped, drum-shaped or conveyor-shaped.

7. The tactile pin holding apparatus according to claim 1, 5 wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

8. A tactile pin holding apparatus comprising:

a holding member having a tactile surface and a first 10 number of holes, and being provided for supporting the first number of tactile pins in the holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column and in a second 15 number of groups at the tactile surface, the second number being smaller than the first number; and

elastic members, in the second number, respectively corresponding to the second number of the groups of tactile pins and being arranged at the holding member for pressing and 20 holding the tactile pins with the holding member in a manner that each of the tactile pins in each of the groups of tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins, wherein each of the holes comprises an engagement portion, 25 and each of the tactile pins in the each of the holes

comprises a step portion engageable with the engagement portion of the each of the holes, such that when the step portion of the each of the tactile pins is engaged with the engagement portion of the each of the holes, the each of the 5 tactile pins is held at a desired height relative to the tactile surface.

9. The tactile pin holding apparatus according to claim 8, which further comprises engagement release members each for being coupled to each of the tactile pins for releasing the 10 engagement between the step portion of the each of the tactile pins and the engagement portion of the each of the holes.

10. The tactile pin holding apparatus according to claim 8, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the 15 rows of tactile pins is an elastic ring placed annularly at the holding member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

11. The tactile pin holding apparatus according to claim 8, wherein the second number is equal to half of the number of 20 columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, and the 25 tactile pins in the other column are pressed and held by the

opposite side of the elastic rod.

12. The tactile pin holding apparatus according to claim 8, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic 5 segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment.

10 13. The tactile pin holding apparatus according to claim 8, wherein the each of the tactile pins in the each of the groups of tactile pins has an annular groove for engagement with the elastic member corresponding to the each of the groups of tactile pins

15 14. The tactile pin holding apparatus according to claim 8, wherein the holding member is disc-shaped, drum-shaped or conveyor-shaped.

16. The tactile pin holding apparatus according to claim 8, wherein each of the elastic members is a non-metal ring-20 shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

17. A tactile pin holding apparatus comprising:  
a holding member having a tactile surface and holes, and  
being provided for supporting tactile pins in the holes,  
25 respectively, to be movable up-and-down therein relative to

the tactile surface for displaying characters and/or graphics;  
and

ring-shaped elastic members, each being arranged in each  
of the holes of the holding member and having each of the  
5 tactile pins fitly inserted therein for pressing and holding  
the each of the tactile pins with the holding member at a  
desired height relative to the tactile surface, wherein the  
each of the tactile pins is movable up-and-down in the each of  
the holes when a force exceeding a given value is applied to  
10 the each of the tactile pins in up-and-down direction.

17. The tactile pin holding apparatus according to claim  
16, wherein each of the tactile pins in each of the holes has  
an annular groove for engagement with the elastic member  
arranged in the each of the holes.

15 18. The tactile pin holding apparatus according to claim  
16, wherein the holding member is disc-shaped, drum-shaped or  
conveyor-shaped.

19. A tactile pin display apparatus comprising:  
a rotational member having a tactile surface and a first  
20 number of holes, and being provided for supporting the first  
number of tactile pins in the holes, respectively, to be  
movable up-and-down therein relative to the tactile surface  
for displaying characters and/or graphics, the tactile pins  
being arranged in multi-row multi-column and in a second  
25 number of groups at the tactile surface, the second number

being smaller than the first number;

elastic members, in the second number, respectively corresponding to the second number of groups of tactile pins and being arranged at the rotational member for pressing and

5 holding the tactile pins with the rotational member in a manner that each of the tactile pins in each of the groups of tactile pins is pressed at one side thereof by the elastic member corresponding to the each of the groups of tactile pins and can thereby be held at a desired height relative to the

10 tactile surface, and that the each of the tactile pins is movable up-and-down when a force exceeding a given value is applied to the each of the tactile pins in up-and-down direction;

rotation driving means coupled to the rotational member

15 for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset height when the tactile pins are brought to contact with the pin height reset member during the rotation of the rotational

20 member;

actuators provided nearby the rotational member for moving the tactile pins; and

selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the

25 tactile pins to be positioned at desired heights, respectively,

relative to the tactile surface.

20. The tactile pin display apparatus according to claim 19, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the 5 rows of tactile pins is an elastic ring placed annularly at the rotational member for pressing, at one side thereof, and holding each of the tactile pins in the each of the rows.

21. The tactile pin display apparatus according to claim 19, wherein the second number is equal to half of the number 10 of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, 15 and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

22. The tactile pin display apparatus according to claim 19, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic 20 segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment.

25 23. The tactile pin display apparatus according to claim

19, wherein the each of the tactile pins in the each of the groups of tactile pins has an annular groove for engagement with the elastic member corresponding to the each of the groups of tactile pins.

5        24. The tactile pin display apparatus according to claim 19, wherein the rotational member is disc-shaped, drum-shaped or conveyor-shaped.

10       25. The tactile pin display apparatus according to claim 19, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

15       26. The tactile pin display apparatus according to claim 19, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

20       27. The tactile pin display apparatus according to claim 19, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

25       28. The tactile pin display apparatus according to claim 19, which further comprises an abnormal load detecting means for detecting an abnormal load applied to the rotational member.

29. The tactile pin display apparatus according to claim 19, which further comprises an indicator portion provided

nearby the rotational member for a user to put its finger at  
for touching the tactile pins.

30. The tactile pin display apparatus according to claim  
19, wherein photocatalytic function is provided to at least  
5 the rotational member or the tactile pins.

31. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and a first  
number of holes, and being provided for supporting the first  
number of tactile pins in the holes, respectively, to be  
10 movable up-and-down therein relative to the tactile surface  
for displaying characters and/or graphics, the tactile pins  
being arranged in multi-row multi-column and in a second  
number of groups at the tactile surface, the second number  
being smaller than the first number;

15 elastic members, in the second number, respectively  
corresponding to the second number of groups of tactile pins  
and being arranged at the rotational member for pressing and  
holding the tactile pins with the rotational member in a  
manner that each of the tactile pins in each of the groups of  
20 the tactile pins is pressed at one side thereof by the elastic  
member corresponding to the each of the groups of tactile pins,  
wherein each of the holes comprises an engagement portion,  
and each of the tactile pins in the each of the holes  
comprises a step portion engageable with the engagement  
25 portion of the each of the holes, such that when the step

portion of the each of the tactile pins is engaged with the engagement portion of the each of the holes, the each of the tactile pins is held at a desired height relative to the tactile surface;

5        rotation driving means coupled to the rotational member for rotating the rotational member;

          a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset height when the tactile pins are brought to contact with the  
10      pin height reset member during the rotation of the rotational member;

          engagement release members each being brought to contact with each of the tactile pins in each of the holes, during the rotation of the rotational member, for releasing the  
15      engagement between the step portion of the each of the tactile pins and the engagement portion of the each of the holes, the engagement release members being placed upstream of the pin height reset member in the rotation of the rotational member;

20      actuators provided nearby the rotational member for moving the tactile pins; and

          selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

25      32. The tactile pin display apparatus according to claim

31, wherein the second number is the number of rows of tactile pins, and each of the elastic members provided for each of the rows of tactile pins is an elastic ring placed annularly at the rotational member for pressing, at one side thereof, and 5 holding each of the tactile pins in the each of the rows.

33. The tactile pin display apparatus according to claim 31, wherein the second number is equal to half of the number of columns of tactile pins, and each of the elastic members is an elastic rod extending in column direction and being 10 sandwiched between a pair of adjacent columns of tactile pins in a manner that the tactile pins in one column of the pair of columns are pressed and held by one side of the elastic rod, and the tactile pins in the other column are pressed and held by the opposite side of the elastic rod.

15 34. The tactile pin display apparatus according to claim 31, wherein the second number is equal to half of the number of tactile pins, and each of the elastic members is an elastic segment sandwiched between a pair of adjacent tactile pins in each row in a manner that one of the pair of tactile pins is 20 pressed and held by one side of the elastic segment, and the other tactile pin is pressed and held by the opposite side of the elastic segment.

35. The tactile pin display apparatus according to claim 31, wherein the each of the tactile pins in the each of the 25 groups of tactile pins has an annular groove for engagement

with the elastic member corresponding to the each of the groups of tactile pins.

36. The tactile pin display apparatus according to claim 31, wherein the rotational member is disc-shaped, drum-shaped 5 or conveyor-shaped.

37. The tactile pin display apparatus according to claim 31, wherein each of the elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

10 38. The tactile pin display apparatus according to claim 31, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

15 39. The tactile pin display apparatus according to claim 31, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

20 40. The tactile pin display apparatus according to claim 31, wherein the number of the engagement release members is equal to the number of rows of tactile pins.

41. The tactile pin display apparatus according to claim 31, which further comprises abnormal load detecting means for detecting an abnormal load applied to the rotational member.

25 42. The tactile pin display apparatus according to claim 31, which further comprises an indicator portion provided

nearby the rotational member for a user to put its finger at for touching the tactile pins.

43. The tactile pin display apparatus according to claim 31, wherein photocatalytic function is provided to at least 5 the rotational member or the tactile pins.

44. A tactile pin display apparatus comprising:  
a rotational member having a tactile surface and holes, and being provided for supporting tactile pins in the holes, respectively, to be movable up-and-down therein relative to 10 the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column at the tactile surface;

ring-shaped elastic members, each being arranged in each of the holes of the rotational member and having each of the 15 tactile pins fitly inserted therein for pressing and holding the each of the tactile pins with the rotational member at a desired height relative to the tactile surface, wherein the each of the tactile pins is movable up-and-down in the each of the holes when a force exceeding a given value is applied to 20 the each of the tactile pins in up-and-down direction;

rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset 25 height when the tactile pins are brought to contact with the

pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

5       selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

45. The tactile pin display apparatus according to claim  
10 44, wherein each of the ring-shaped elastic members is a non-metal ring-shaped member, a non-metal rod-shaped member, a non-metal tube-shaped member or a compression coil spring.

46. The tactile pin display apparatus according to claim  
15 44, wherein each of the tactile pins in each of the holes has an annular groove for engagement with the elastic member arranged in the each of the holes.

47. The tactile pin display apparatus according to claim  
44, wherein the rotational member is disc-shaped, drum-shaped or conveyor-shaped.

20       48. The tactile pin display apparatus according to claim  
44, wherein the number of the actuators is equal to the number of rows of tactile pins, and the actuators are placed distantly from each other.

49. The tactile pin display apparatus according to claim  
25 44, wherein the number of the actuators is equal to the number

of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

50. The tactile pin display apparatus according to claim 44, which further comprises abnormal load detecting means for 5 detecting an abnormal load applied to the rotational member.

51. The tactile pin display apparatus according to claim 44, which further comprises an indicator portion provided nearby the rotational member for a user to put its finger at for touching the tactile pins.

10 52. The tactile pin display apparatus according to claim 44, wherein photocatalytic function is provided to at least the rotational member or the tactile pins.

53. A tactile pin display apparatus comprising:  
a rotational member having a tactile surface and holes,  
15 and being provided for supporting tactile pins in the holes,  
respectively, to be movable up-and-down therein relative to  
the tactile surface for displaying characters and/or graphics,  
the tactile pins being arranged in multi-row multi-column at  
the tactile surface and each having an annular groove;  
20 elastic cantilevers, each being arranged in  
correspondence with each of the holes of the rotational member  
and each having an engagement portion engageable with the  
annular groove of the each of the tactile pins for pressing  
and holding the each of the tactile pins with the rotational  
25 member,

wherein the each of the tactile pins is movable up-and-down in the each of the holes when a force exceeding a given value is applied to the each of the tactile pins in up-and-down direction;

5 rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset height when the tactile pins are brought to contact with the 10 pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

selectively driving means coupled to the actuators for 15 selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

54. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and first 20 holes, and being provided for supporting tactile pins in the first holes, respectively, to be movable up-and-down therein relative to the tactile surface for displaying characters and/or graphics, the tactile pins being arranged in multi-row multi-column at the tactile surface and each having an annular 25 groove;

an elastic sheet member having second holes, each being arranged in correspondence with each of the first holes of the rotational member and each being engageable with the annular groove of the each of the tactile pins for pressing and

5 holding the each of the tactile pins with the rotational member,

wherein the each of the tactile pins is movable up-and-down in the each of the first and the second holes when a force exceeding a given value is applied to the each of the

10 tactile pins in up-and-down direction;

rotation driving means coupled to the rotational member for rotating the rotational member;

a pin height reset member provided nearby the rotational member for resetting the height of the tactile pins at a reset

15 height when the tactile pins are brought to contact with the pin height reset member during the rotation of the rotational member;

actuators provided nearby the rotational member for moving the tactile pins; and

20 selectively driving means coupled to the actuators for selectively driving the actuators to selectively move the tactile pins to be positioned at desired heights, respectively, relative to the tactile surface.

55. The tactile pin display apparatus according to claim

25 54, wherein the number of the actuators is equal to the number

of rows of tactile pins, and the actuators are driven at timings respectively different from each other.

56. A tactile pin display apparatus comprising:

a rotational member having a tactile surface and tactile pins to be movable up-and-down relative to the tactile surface;

a moving mechanism coupled to the tactile pins for moving the tactile pins up-and-down relative to the tactile surface; and

10 rotation driving means coupled to the rotational member, wherein photocatalytic function is provided to at least the rotational member or the tactile pins.

57. A braille display member having photocatalytic function on a surface thereof or inside thereof.